

WHAT IS CLAIMED IS:

1. A simulation method of simulating a behavior of a mechanism using a hybrid model including a state transition model and a continuous system model, the  
5 method comprising:

analyzing the hybrid model to extract a first description data of a state transition model and a second description data of a continuous system model;

10 generating a table representing a relationship between continuous system equations and switching conditions thereof, based on the extracted first description data;

15 generating a plurality of internal data expressions of the continuous system equations, based on the extracted second description data;

selecting an active continuous system equation by looking up the table according to an occurrence of an event; and

20 outputting data that represents the behavior of the mechanism by solving the selected active continuous system equation by numerical integration using one or more of the internal data expressions that corresponds to the selected active one or more continuous system equations.

25 2. The method according to claim 1, further comprising:

switching the active one of the continuous system

equations to the another continuous system equation by operating a flag assured for each of the continuous system equations.

3. The method according to claim 1, wherein the  
5 event is responsive to one of a control signal and an evaluation result of an internal variable, the control signal being provided from an external process including mechanism control software that controls the mechanism.

10 4. The method according to claim 1, further comprising executing a kinematics simulation which uses the data that represents the behavior of the mechanism.

5. A simulation method of simulating a behavior of a mechanism using a hybrid model including a state  
15 transition model and a continuous system model, the method comprising:

analyzing the hybrid model to extract a first description data of a state transition model and a second description data of a continuous system model;

20 generating a table representing a relationship between continuous system equations and switching conditions thereof, based on the extracted first description data;

25 generating a plurality of internal data expressions of the continuous system equations, based on the extracted second description data; and performing a simulation of the behavior of

the mechanism while referring to the table and the plurality of internal data expressions of the continuous system equations.

6. A simulation method of simulating a behavior 5 of a mechanism using a hybrid model including a state transition model and a continuous system model, the method comprising:

analyzing the hybrid model to extract a first description data of a state transition model and a 10 second description data of a continuous system model;

generating a first program code based on the extracted first description data;

generating a second program code based on the extracted second description data;

15 generating a plurality of internal data expressions of the continuous system equations by executing the second program;

switching continuous system equations according to switching conditions thereof by executing the first 20 program; and

outputting data that represents the behavior of the mechanism by solving the continuous system equations by numerical integration using the internal data expressions.

25 7. A simulation apparatus which simulates a behavior of a mechanism using a hybrid model including a state transition model and a continuous system model,

comprising:

an analyzing unit configured to analyze the hybrid model to extract a first description data of a state transition model and a second description data of  
5 a continuous system model;

a first generating unit configured to generate a table representing a relationship between continuous system equations and switching conditions thereof, based on the extracted first description data;

10 a second generating unit configured to generate a plurality of internal data expressions of the continuous system equations, based on the extracted second description data; and

a simulation execution unit configured to:

15 select an active continuous system equation by looking up the table according to an occurrence of an event; and

20 output data that represents the behavior of the mechanism by solving the selected active continuous system equation by numerical integration using one or more of the internal data expressions that corresponds to the selected active one or more continuous system equations.

8. The apparatus according to claim 7, wherein  
25 the simulation execution unit switches an active one of the continuous system equations to another continuous system equation by operating a flag assured for each of

the continuous system equations.

9. The apparatus according to claim 7, wherein  
the event is responsive to one of a control signal and  
an evaluation result of an internal variable, the  
5 control signal being provided from an external process  
including mechanism control software that controls the  
mechanism.

10. The apparatus according to claim 7, further  
comprising a kinematics simulation execution unit  
10 configured to execute a kinematics simulation which  
uses the data that represents the behavior of the  
mechanism.

11. A simulation apparatus which simulates a  
behavior of a mechanism using a hybrid model including  
15 a state transition model and a continuous system model,  
comprising:

an analyzing unit configured to analyze the hybrid  
model to extract a first description data of a state  
transition model and a second description data of  
20 a continuous system model;

a first generating unit configured to generate  
a table representing a relationship between continuous  
system equations and switching conditions thereof,  
based on the extracted first description data;

25 a second generating unit configured to generate  
a plurality of internal data expressions of the  
continuous system equations, based on the extracted

second description data; and

a simulation execution unit configured to execute a simulation of the behavior of the mechanism, while referring to the table and the plurality of internal data expressions of the continuous system equations.

12. A simulation apparatus which simulates a behavior of a mechanism using a hybrid model including a state transition model and a continuous system model, comprising:

10 an analyzing unit configured to analyze the hybrid model to extract a first description data of a state transition model and a second description data of a continuous system model;

15 a first generating unit configured to generate a first program code based on the extracted first description data;

a second generating unit configured to generate a second program code based on the extracted second description data;

20 a third generating unit configured to generate a plurality of internal data expressions of the continuous system equations by executing the second program;

25 a switching unit configured to switch continuous system equations according to switching conditions thereof by executing the first program; and

an outputting unit configured to output data that

represents the behavior of the mechanism by solving the continuous system equations by numerical integration using the internal data expressions.

13. A computer program stored in a computer  
5 readable medium for simulating a behavior of a mechanism using a hybrid model including a state transition model and a continuous system model, the program comprising:

means for instructing a computer to analyze the  
10 hybrid model to extract a first description data of a state transition model and a second description data of a continuous system model;

15 means for instructing the computer to generate a table representing a relationship between continuous system equations and switching conditions thereof, based on the extracted first description data;

20 means for instructing the computer to generate a plurality of internal data expressions of the continuous system equations, based on the extracted second description data; and

means for instructing the computer to select an active continuous system equation by looking up the table according to an occurrence of an event; and

25 means for instructing the computer to output data that represents the behavior of the mechanism by solving the selected active continuous system equation by numerical integration using one or more of the

internal data expressions that corresponds to the selected active one or more continuous system equations.

14. The program according to claim 13, further  
5 comprising means for instructing the computer to switch an active one of the continuous system equations to another continuous system equation by operating a flag assured for each of the continuous system equations.

15. The program according to claim 13, wherein  
10 the event is responsive to one of a control signal and an evaluation result of an internal variable, the control signal being provided from an external process including mechanism control software that controls the mechanism.

15 16. The program according to claim 13, further comprising means for instructing the computer to execute a kinematics simulation which uses the data that represents the behavior of the mechanism.

17. A computer program stored in a computer  
20 readable medium for simulating a behavior of a mechanism using a hybrid model including a state transition model and a continuous system model, the program comprising:

means for instructing a computer to analyze the  
25 hybrid model to extract a first description data of a state transition model and a second description data of a continuous system model;

means for instructing the computer to generate a table representing a relationship between continuous system equations and switching conditions thereof, based on the extracted first description data;

5 means for instructing the computer to generate a plurality of internal data expressions of the continuous system equations, based on the extracted second description data; and

10 means for instructing the computer to execute a simulation of the behavior of the mechanism, while referring to the table and the plurality of internal data expressions of the continuous system equations.

18. A computer program stored in a computer readable medium for simulating a behavior of a mechanism using a hybrid model including a state transition model and a continuous system model, the program comprising:

means for instructing a computer to analyze the hybrid model to extract a first description data of a state transition model and a second description data of a continuous system model;

means for instructing the computer to generate a first program code based on the extracted first description data;

25 means for instructing the computer to generate a second program code based on the extracted second description data;

means for instructing the computer to generate a plurality of internal data expressions of the continuous system equations by executing the second program;

- 5        means for instructing the computer to switch continuous system equations according to switching conditions thereof by executing the first program; and
- means for instructing the computer to output data that represents the behavior of the mechanism by
- 10      solving the continuous system equations by numerical integration using the internal data expressions.